



EPA Region 7 TMDL Review

TMDL ID: Waterbody IDs: 1592
Waterbody Name: Brushy Creek
Tributary:
Pollutant: Biological oxygen demand (BOD) and Volatile suspended solids (VSS)
State: MO **HUCs:** 10290202-020001
BASIN: Big Piney Watershed
Submittal Date: October 31, 2005
Approved: Yes

Submittal Letter

State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.

A letter formally submitting this TMDL under Section 303(d) of the Clean Water Act was received October 31, 2005.

Water Quality Standards Attainment

The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.

The loading capacity for biological oxygen demand (BOD), volatile suspended solids (VSS), and ammonia are identified, and were determined using the QUAL2E water quality model, and best professional judgement, respectively. Violation of narrative water quality standards for VSS have been observed in the form of sludge deposits, and dense covering of filamentous algae has also been observed. Missouri Department of Conservation personnel and the public have historically filed complaints about the "polluted" condition of Brushy Creek; these impairments are directly attributable to the Houston Brushy Creek wastewater treatment plant (WWTP).

BOD loading resulting in violations of the dissolved oxygen (DO) criterion were modeled based upon meeting 5.0 mg/L DO in Brushy Creek which, upon implementation of the WLA concentration-based permit limits, should result in attainment of both narrative and numeric water quality standards (WQS) for the protection of the Warm water Aquatic Life designated use. Additional water quality-based permit limits for ammonia and significantly reduced TSS permit limits will also ensure WQS will be attained.

Numeric Target(s)

Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

All WQS, criteria, and beneficial uses have been described. BOD and ammonia are the parameters modeled to determine the impact the WWTP will cause on DO levels in Brushy Creek; seasonal ammonia criteria were targeted using temperature and pH per the MO WQS. The VSS criteria is narrative, therefore in this TMDL, the target value was derived using best professional judgement due to the fact there is no immediate upstream VSS data which would assist in targeting a natural background concentration. The rationale is provided as setting TSS limits equal to those of the BOD5, which results in a 70% reduction of TSS coming from the WWTP, and ensures no objectionable bottom deposits will occur as a result of the WWTP's effluent.

Link between Numeric Target(s) and Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.

The numeric link between DO, and BOD and ammonia, was generated by the water quality model QUAL2E. Seasonal ammonia criteria were targeted using temperature and pH per the MO WQS. There are no numeric criteria for VSS and there are no natural background concentration data, therefore, it was necessary to rely on best professional judgement and use a 70% reduction of TSS in the WWTP's effluent.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.

Land use and soils are described, as well as the history of the area. The sole source of the impairment is the Houston WWTP, NPDES permit number MO-0039675. In 2001, a fish kill occurred in Brushy Creek near Houston; the source of the kill was reported to be the result of continuous sewage bypass releases from the WWTP. It appears all major sources have been considered.

Allocation

Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.

The QUAL2E model was calibrated to bring the simulation of flow, velocity, BOD, DO, organic nitrogen, ammonia nitrogen, nitrate and nitrite nitrogen, total phosphorus, and VSS within the range of measured data for these parameters. The WLAs for BOD, VSS and ammonia-N were derived from adjusting the plant discharge in the model to the full design flow of 0.62 cfs, and the estimated instream flow to 0.83 cfs. This estimated flow was then reduced by 75% (to 0.21 cfs) for modeling purposes in accordance with the Missouri code of state regulations for mixing zones in streams this size (MO 10 CSR 20-7.031(4)5.B.(II)(a)), therefore, a mixing zone applies to this TMDL. An additional test was done with the model with the application of winter conditions. The WLA concentrations are identified and will be incorporated into Houston's WWTP NPDES permit in the next permit reissuance which is scheduled for October 4, 2006.

WLA Comment

The WLA's for the City of Houston WWTP are as follows:

Load of 8 mg/L BOD - equivalent to 26.8 pounds/day of CBOD, these correspond to a NPDES permit maximum daily limit of 18 mg/L BOD and average monthly limit of 11.5 mg/L BOD;

Load of 8 mg/L VSS, which also correspond to a NPDES permit maximum daily limit of 18 mg/L TSS and average monthly limit of 11.5 mg/L TSS;

NH₃-N (ammonia as nitrogen) is seasonal based upon summer and winter:

Summer May 1 – Oct 31: 1.9 mg/L NH₃-N and 6.36 pounds/day; permit limits translated from the WLA are a maximum daily limit of 3.1 mg/L and an average monthly limit of 1.6 mg/L.

Winter Nov 1 – Apr 30: 2.4 mg/L NH₃-N and 8.03 pounds/day; permit limits translated from the WLA are a maximum daily limit of 4.0 mg/L and an average monthly limit of 2.0 mg/L.

LA Comment

The load allocation is zero.

Margin of Safety

Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.

The MOS is implicit based upon the model assumptions and calculations. The limits for BOD, VSS and NH₃-N were derived from QUAL2E simulations that maintained at least a 10% margin beyond target concentrations. Additionally, a concrete plant (Redi-mix) used to be upstream of the WWTP and the potential load coming from that plant was incorporated into the QUAL2E model, however, that plant closed in 2002, so consideration of it in the model as an additional source is an added MOS.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).

Seasonal variation is taken into consideration for ammonia as nitrogen and a separate limit calculated for each summer and winter. Otherwise, the WWTP NPDES permit limits apply year-long.

Public Participation

Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).

The Missouri Dept. of Natural Resources (MDNR) placed this TMDL on public notice from August 26 to September 25, 2005, on MDNR's state website. Groups which received the public notice announcement included the Missouri Clean water Commission, Houston Brushy Creek WWTP, the Water Quality Coordinating Committee, stream Team volunteers in the county (27), the legislators representing Texas County (3), and others that routinely receive the public notice of NPDES permits.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).

MDNR will conduct two special sediment studies in Brushy Creek in 2007 and 2008. Instream monitoring is required in the Houston WWTP permit and requires samples be taken from four instream monitoring sites for the following parameters: pH, temperature, total ammonia, DO and phosphorus.

Reasonable assurance

Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.

The WLA's are set to meet water quality standards, no reasonable assurances are required of the LA.